

CALIBRATION OF THE RADIOMETER IN THE CASSINI RADAR INSTRUMENT

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The RADAR instrument on the Cassini mission to Saturn includes a 13.8 GHz radiometer that can operate alone or simultaneously with the radar. The radiometer was added to complement the radar mapping of the surface of Titan, Saturn's largest moon. Titan has a thick, cloudy atmosphere and a surface thought to include liquid hydrocarbon lakes or oceans covering its icy mantle. The radiometer will map the microwave brightness of Titan's surface in conjunction with radar imaging, and will also obtain valuable measurements of Saturn's atmosphere and rings in another phase of the Cassini mission.

The value of the measurements is enhanced by obtaining the best possible radiometric calibration; for example, the composition of a lake is constrained by the dielectric constant that can be inferred from the microwave brightness temperature of the lake's surface and independently obtained measurements of its physical temperature.

We will calibrate the radiometer by observing bright radioastronomical calibration sources such as M17, Cassiopeia A, and Taurus A that are easily seen in the radiometer's 0.35 degree beam. The Cassini spacecraft will fly past Jupiter in December of 2000, affording us the use of Jupiter as a standard source as well. Our plan is to perform a sequence of observations of Jupiter and standard sources from the spacecraft during the flyby period, in conjunction with a number of ground-based observations of these sources with well-calibrated radio telescopes. The ground-based effort will be carried out using two 34-meter-diameter radio telescopes at Goldstone, led by a partnership involving NASA, the Jet Propulsion Laboratory and the Lewis Center for Educational Research (LCER) in Apple Valley, CA.